

Chaetognaths of Misaki Harbor.

By T. Aida.

Zoological Institute, Science College, Imp. Univ., Tokyo.

With Pl. III. & one wood-cut.

During the frequent visits made to the Marine Zoological Station of the Imperial University at Misaki for the last two years, I have devoted myself specially to the collection of the chaetognaths to be found in the harbor. Up to date, I have been able to collect twelve species in all. The majority of these can not, however, be fished at all seasons of the year, as their presence depends a great deal on current and wind. For instance, late in summer last year, when an offshoot of the Great Black Stream (*kuroshiwo*) swept into the harbor, many species not to be seen at other times were caught. I do not therefore think that the list here given is by any means exhaustive. Other species will no doubt be added hereafter from time to time.

Of the twelve species mentioned below, four I believe to be new to science. I have adopted the classification of Langerhans (1), as it appears most convenient to me.

1. *Sagitta bipunctata*, Quoy et Gaimard.

(Fig. 1.)

Literature: LANGERHANS (1), HERTWIG (2), GRASSI (3), STRODTMANN (4).

The specimens which I refer to this species present characters agreeing essentially with the descriptions given by the authors cited above, the agreement being especially noticeable in the position and size of the fins, the thickness of the epidermis, the form and position of the *corona ciliata*, the length of the body and its ratio to the length of the caudal segment, the size of the ovaries, and a few other points. But

there are some discrepancies in the number of the seizing hooks and teeth. Our specimens have 6-7 seizing hooks, 10-12 anterior teeth, and 18-21 posterior teeth, while GRASSI (3) and STRODTMANN (4) give for European specimens 8-10 seizing hooks, 4-6 anterior teeth, and 10-15 posterior teeth. Thus our specimens have a greater number of teeth and a smaller number of seizing hooks than those of Europe. Notwithstanding this difference, I think it correct to refer them to the same species, as they agree in so many other characters.

2. *Sagitta serratodentata*, Krohn.

(Figs. 2 & 3.)

Literature: GRASSI (3), HERTWIG (2), STRODTMANN (4).

This species is rare in Misaki, and I caught only three during the spring of 1896. It resembles closely *Sagitta bipunctata*, but is distinguished from it by its serrated seizing hooks, thinner epidermis and smaller size.

Strodtmann (4) states that the tip of the teeth is distinctly star-shaped in this species and has at its center the opening of the canal which runs through the body of the teeth. But I was unable to find such an opening in the teeth of our species. The canal ends at the top of the teeth blindly and four processes of different size surround the top (fig. 13).

3. *Sagitta hexaptera*, D'Orbigny.

(Fig. 3.)

Literature: LANGERHANS (1), HERTWIG (2), GRASSI (3), STRODTMANN (4).

All the specimens of this species which I have fished are young, with unripe genital organs. The pear-shaped *corona ciliata* on the head segment, the wide lateral field, the number of the seizing hooks and teeth, and the shape and position of the lateral fins, all point to the identity of this species with that described by European authors.

4. *Sagitta lyra*, Krohn.

(Fig. 4.)

Literature: LANGERHANS (1), HERTWIG (2), GRASSI (3), STRODTMANN (4).

I fished only a few individuals of this species together with *Sagitta hexaptera* during the spring of 1896. The largest specimen I have caught was 3 cm. long, and its caudal segment 4.5 mm., but its genital organs were not ripe.

This species has a very wide trunk and a narrow caudal segment, and two pairs of lateral fins which are continued into each other, the first pair being long and extending anteriorly to the level of the abdominal ganglion.

5. *Sagitta minima*, (Grassi).

(Fig. 5.)

Literature: GRASSI (3), STRODTMANN (4).

This is a small-sized species. The larger individuals reach the length of 1 cm. and its caudal segment the length of 1.5 mm.

The epidermis is thin. The lateral field is pretty wide. As the body is widest in the lower part of the trunk and the caudal segment is comparatively narrow, it is constricted at the border of these two segments as in *Sagitta lyra*. The top of the seizing hook is strongly curved inwards. The ovaries are short, and generally terminate at the level of the anterior end of the second lateral fin. The *corona ciliata* is elliptic and lies wholly on the trunk segment. The intestine is very wide, nearly filling up the body cavity, and shows here and there transverse wrinkles. It has two diverticula at its beginning.

6. *Sagitta enflata*, (Grassi).

(Fig. 6.)

Literature: GRASSI (3), STRODTMANN (4).

This species is abundant in Misaki. It can be fished at all seasons

of the year, though the number differs according to meteorological conditions. The length of the body when fully grown is 12mm. and its breadth 1.6mm. The caudal segment is 2mm. The anterior pair of lateral fins lies midway between the abdominal ganglion and the posterior end of the trunk segment. The second pair is much larger, and extends along the lower part of the trunk, to the middle of the caudal segment. The epidermis and the muscular coat are very thin. The ovaries are small and scarcely reach the upper end of the second lateral fin. The head is comparatively small, and has 9-10 seizing hooks, 6-8 anterior teeth, and 10-11 posterior teeth. The *corona ciliata* is skein-shaped and lies on the head segment. The ratio of the length of the caudal segment to that of the whole body is, in our specimens $\frac{1}{5}$ — $\frac{1}{6}$, thus differing from that given by GRASSI, which is $\frac{1}{4}$.

7. *Sagitta neglecta*, nov. sp.

(Fig. 7.)

This is the smallest sized species. The whole length of the body is 7mm., that of the caudal segment 1.7mm., and the breadth 0.35mm. The fins are five; the first pair of fins begin at the posterior end of the ventral ganglion; the second pair, which is separated from the first, is longer, extending to the middle of the caudal segment. Both lateral fins are semi-elliptic. The *corona ciliata* is long, like that of *Sagitta bipunctata*, and lies wholly on the trunk segment, never extending to the head segment between the eyes. Seizing hooks 8; posterior teeth 10-12, anterior teeth 4-5. The top of each tooth has five processes. The ovaries reach the upper end of the second pair of fins. The spermatocyst is comparatively large. The epidermis thickens at the anterior part of the trunk, as in *Sagitta bipunctata*. The intestine has two diverticula at its anterior end.

This species is abundant in Misaki throughout the year.

8. *Sagitta regularis*, nov. sp.

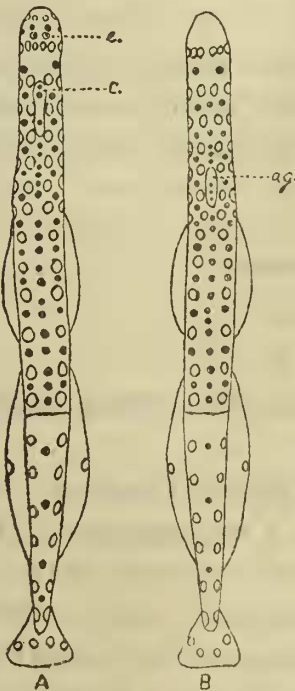
(Fig. 8.)

A small-sized species. Larger specimens 7mm. long and 0,5mm. broad. The caudal segment is nearly $\frac{1}{3}$ of the whole length of the body. The epidermis is thick throughout the entire body, but especially so in the anterior part of the trunk, so that the head is not constricted from the body as in other species. The muscular layer is very thick. The two pairs of lateral fins are separated, and each fin has the shape of a semi-ellipse. The first fin is short, being nearly half as long as the second fin which lies mainly on the caudal segment. Seizing hooks 7; anterior teeth 2-4, posterior teeth 5-7.

The intestine has two diverticula at its beginning. The mature ovaries may extend nearly to the anterior end of the first lateral fin. The *corona ciliata* is long and elliptic, and is on the trunk segment. The tactile prominences are well developed and regularly arranged.

As GRASSI says, there are in all chaetognaths two kinds of tactile prominences: one kind is larger, and the hairs, which are longer than those on the other kind, are arranged in transverse planes, while the second kind is smaller and has shorter hairs arranged in longitudinal planes. These two prominences are arranged in this species regularly in alternate transverse rows except in the dorsal and ventral median lines of the body, where the small prominences of the second kind lie in a longitudinal row at irregular intervals.

In the above wood-cut where A shows the dorsal and B the ventral surface,



Wood-cut 1.

e=eye, c=corona ciliata,
ag=abdominal ganglion.

the tactile prominences of the first kind are shown with clear circles and those of the second with black spots. It may be gathered from the figures that the number of tactile prominences of the first kind in each transverse row, is reduced from 6 in the anterior part of the trunk to 4 in the posterior half, beginning from the level of the first lateral fin. In each transverse row of the prominences of the second kind 4 lie exactly between the prominences of the first kind. It must be noted, however, that the alternation of the rows of prominences of the two kinds are not rigidly carried out, as sometimes two transverse rows of the second kind are placed between the rows of prominences of the first kind. This irregularity commonly occurs in the other species having a similar arrangement of tactile prominences.

In the caudal segment, the tactile prominences are comparatively few; and in the head they are found only on the dorsal surface.

Sagitta bipunctata (small specimens), *Sagitta neglecta*, *Sagitta minima*, *Sagitta serratodentata*, *Krohnia viridis*, *Krohnia foliacea*, and *Spadella draco* have all a more or less similar arrangement of tactile prominences, but none of them shows such a regularity as is found in this species.

9. *Sagitta hispida*, Conant.

(Fig 9.)

Literature: CONANT (5).

Whole length of the body 11mm. that of the caudal segment 2.8mm., and the breadth 0.7mm.

The epidermis thickens at the neck as in *Sagitta bipunctata*. The muscular coat is thick and gives the animal a stout appearance. The two pairs of lateral fins are separated; the first fin is shorter and begins slightly behind the abdominal ganglion (in the young, smaller individuals, it begins at the middle of the abdominal ganglion); the second fin is longer, extending to the spermatic vesicle. The head is comparatively large, and has 7-8 seizing hooks, 11-17 posterior teeth, and 7-8 anterior teeth. Our specimens have a greater number of seizing hooks and

teeth than that described by CONANT. The *corona ciliata* is long, extending anteriorly between the eyes to the base of the brain. It does not reach posteriorly, in our specimens, to the level of the abdominal ganglion, as described by CONANT. The intestine has two diverticula at its beginning. The tactile prominences are very numerous and are arranged somewhat like those of *Sagitta hexaptera*.

10. *Krohnia foliacea*, nov. sp.

(Figs 10 & 16.)

The essential characteristic of this species lies in the possession of a single pair of lateral fins of remarkable size. It extends from before the abdominal ganglion to the middle of the caudal segment, and its breadth is nearly equal to that of the trunk. Along its margin the tactile prominences are arranged symmetrically in both fins at more or less regular intervals. The body is 11mm. long, and the caudal segment nearly $\frac{1}{5}$ as long. The epidermis and the muscular coat are thick just as in *Sagitta bipunctata*, comparing individuals of equal size. At the anterior part of the trunk segment there is a thin but well marked transverse muscular layer on the ventral side. The *corona ciliata* is flask-shaped, and lies on the head segment.

Seizing hooks 7, and the single row of teeth, which corresponds to the posterior row in other chaetognaths consists of 5 teeth. The top of the seizing hook is strongly curved inwards (fig 16).

I caught only two specimens of this species in the spring of 1896, and as both were young, with unripe genital organs, I can not give further descriptions.

11. *Krohnia pacifica*, nov. sp.

(Figs. 11, 14, & 15).

This species can be easily distinguished by its faintly yellowish-green epidermis and the ovaries of the same color. One mature

specimen measured 6mm. in length* and 0,33mm. in breadth, and its caudal segment 1.8mm. The head is comparatively small and has 9 seizing hooks and 10-11 teeth arranged in a single row. The row of one side meets at the top of the head with that of the other side (fig 14, a). Each seizing hook has a simple termination like that of *Krohnia subtilis* (fig 15). The fins are three; a single pair of lateral fins extend from before the spermatic vesicle to the level of the anterior end of the ovary, and lies equally on the trunk and caudal segments. The caudal fin is narrow and long, its breadth being nearly one half of its length. It is attached anteriorly to the spermatic vesicle. The *corona ciliata* is elliptic and lies wholly on the trunk segment. The mouth is a transverse slit.

This species greatly resembles *Krohnia subtilis*, but is distinguished by its small head, regular row of teeth, the smaller number of the teeth, and some other characters.

12. *Spadella draco*, (Krohn.)

(Fig 12.)

Literature: LANGERHANS (1), HERTWIG (2), GRASSI (3), STRODTMANN (4).

This is the only species of *Spadella* ever fished in Misaki Harbor. The wide lateral epidermoidal extension of the large vesicular cells, a pair of large tactile prominences, a pair of lateral fins, two rows of teeth, etc. distinguish it from other species.

In conclusion, I wish to tender my thanks to Prof. Dr. K. MITSUKURI for valuable advice and aid.

* Among the chaetognaths from the Bonin Islands, collected by the late Mr. HIROTA, I found one specimen of this species, which differs, however, from those of Misaki in some points. It is a young individual, but its body is 13mm. long. The *corona ciliata* is more elongated posteriorly, like that of *Sagitta neglecta*. The lateral fins extend on the trunk segment nearly one half as much as on the caudal segment.

LITERATURE.

- (1). LANGERHANS, P.—Wurmfauna von Madeira III. Zeitschr. für wissensch. Zoologie. Bd.34, p. 132—136. 1880.
- (2). HERTWIG, O.—Die Chaetognathen, eine Monographie. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1880.
- (3). GRASSI, B.—I Chetognathi. Anatomia e sistematica con aggiunte embriologiche. Fauna und Flora des Golfes von Neapel. 1883.
- (4). STRODTMANN, S.— Die Systematik der Chaetognathen. Archiv für Naturgeschichte, Jahrgang 58, Bd. 1, 1892.
- (5). CONANT, F. S.—Description of Two New Chaetognaths. The Johns Hopkins University Circular, no. 119, June, 1895.
- (6). CONANT, F. S.—Notes on the Chaetognaths. The Annals and Magazine of Natural History, 6. series, vol. 18, no. 105, 1896.

EXPLANATION OF FIGURES.

- Fig. 1. *Sagitta bipunctata*.
 2. *Sagitta serratodentata*.
 3. *Sagitta hexaptera*.
 4. *Sagitta lyra*.
 5. *Sagitta minima*.
 6. *Sagitta enflata*.
 7. *Sagitta neglecta*.
 8. *Sagitta regularis*.
 9. *Sagitta hispida*.
 10. *Krohnia foliacea*.
 11. *Krohnia pacifica*.
 12. *Spadella draco*.
 13. Teeth of *Sagitta serratodentata*.
 14. (a) Ventral view of the head of *Krohnia pacifica*. (b) Its teeth.
 15. Seizing hook of *Krohnia pacifica*.
 16. Top of the seizing hook of *Krohnia foliacea*.